

SeCorr® 08

Operating Instructions



Measurable success by Sewerin equipment

Congratulations.

You have chosen a quality instrument manufactured by Hermann Sewerin GmbH.

Our equipment will provide you with the highest standards of performance, safety and efficiency. They correspond with the national and international guide-lines.

Please read and understand the following operating instructions before using the equipment; they will help you to use the instrument quickly and competently. If you have any queries we are available to offer advice and assistance at any time.

Yours

Hermann Sewerin GmbH

Robert-Bosch-Straße 3
33334 Gütersloh, Germany
Tel.: +49 5241 934-0
Fax: +49 5241 934-444
www.sewerin.com
info@sewerin.com

SEWERIN SARL

17, rue Ampère - BP 211
67727 Hoerdts Cedex, France
Tél. : +33 3 88 68 15 15
Fax : +33 3 88 68 11 77
www.sewerin.fr
sewerin@sewerin.fr

Sewerin Ltd

Hertfordshire
UK
Phone: +44 1462-634363
www.sewerin.co.uk
info@sewerin.co.uk

SEWERIN IBERIA S.L.

Centro de Negocios "Eisenhower"
Avenida Sur del Aeropuerto
de Barajas 28, Of. 2.1 y 2.2
28042 Madrid, España
Tel.: +34 91 74807-57
Fax: +34 91 74807-58
www.sewerin.es
info@sewerin.es

Sewerin Sp.z o.o.

ul. Twórcza 79L/1
03-289 Warszawa, Polska
Tel.: +48 22 675 09 69
Tel. kom.: +48 501 879 444
www.sewerin.pl
info@sewerin.pl

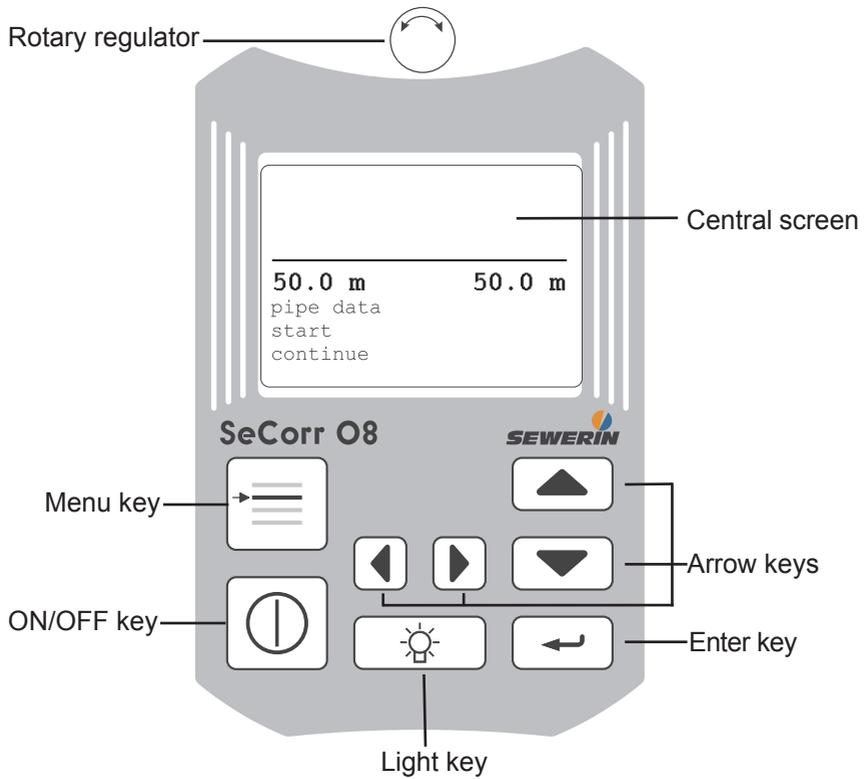
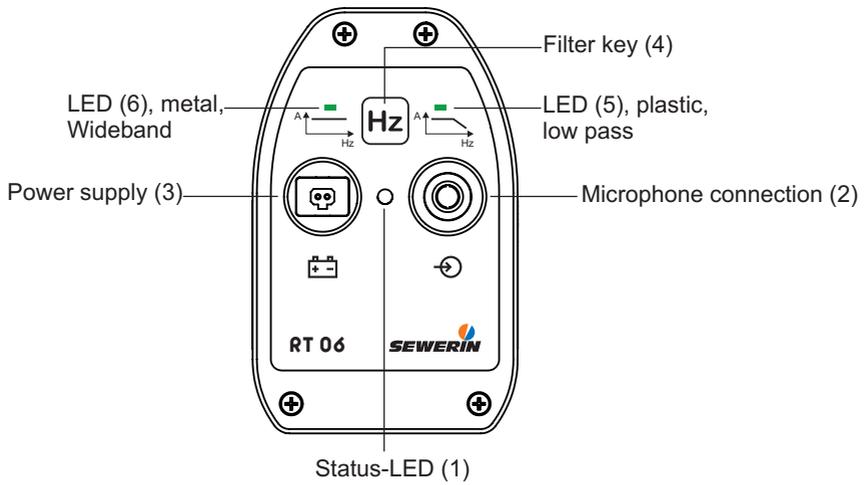


Illustration RT 06



Operating Instructions

SeCorr[®] 08

26.04.2010 – V 4.X – 103923 – en

Warranty & Used symbols

The following instructions must be complied with in order for any warranty to be applicable in respect of the functionality and safe operation of this equipment.

Hermann Sewerin GmbH accepts no liability for any damages resulting from failure to observe these instructions. The warranty and liability provisions of the terms of sale and delivery of Hermann Sewerin GmbH are not affected by the information given below.

- The product must only be operated after the relevant operating instructions have been read and understood.
- The product must only be used for its intended purpose.
- The product is only suitable for use in industrial and commercial applications.
- Repairs must only be carried out by a specialist technician or by other suitably trained personnel.
- Changes or modifications to this product must not be carried out without approval from Hermann Sewerin GmbH. The manufacturer cannot be held responsible for damages if non-approved modifications have been made.
- All repairs must be carried out using replacement parts that have been approved by Hermann Sewerin GmbH.
- The manufacturer reserves the right to make technical modifications in the course of further development.

Generally applicable safety and accident-prevention regulations must be complied with, in addition to the information provided in this manual.

Used symbols:



CAUTION!

This symbol is used to indicate dangers which may either result in hazards for the operators or in severe damage – or even destruction – of the product.



Note:

This symbol is used to call attention to information and tips which may be helpful and which are exceeding the basic operating procedures.

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1 Function description

1.1 Usage

The correlator **SeCorr 08** permits to detect leakage points on directly buried pressure line systems according to the correlation principle. Sensitive microphones are used to record leakage noise on accessible installations and fittings. These recordings are wireless transmitted to the correlator.

SeCorr 08 calculates then the exact leakage position using the Fast Fourier Transformation (FFT = mathematic algorithm).

Supplementary functions are available to improve e.g., the indication of leaks, to enter several pipe sections or to measure the sound velocity.

The **RT 06** radio transmitter can be used to measure fully automatically the input level of the microphone and to set the level control of the amplifier to the optimum value. Characteristics and parameters – such as the used microphone type, the charge state of batteries and the amplifier setting – are wireless transmitted to the correlator for further evaluation.

**Note:**

These operating instructions are based on software release 4.X, with „X“ standing for any number. The currently installed software version of your **SeCorr 08** is displayed after switching on the device. Future releases are subject to change!

2 Use

2.1 First use



CAUTION!

Before placing **SeCorr 08** and **RT 06** for the first time into service, make sure that all used batteries are completely charged. If the batteries are only partially charged, the capacity of the batteries may be reduced thus leading to shorter operation.

2.2 Switching ON/OFF



- Position both piezo microphones at accessible fitting parts. If the circular magnet is screwed on the piezo microphone, it may be required to remove the circular, firmly adhering protective disk from the magnet.

- Plug both microphone connectors into the sockets of the radio transmitter RT 06. If you want to use only one RT 06, it is required to connect a microphone directly to input 2 of the SeCorr 08.

On the RT 06, LED 1 must be lit.



- Connect the headphones to socket 3 of the SeCorr 08.

- Switch on the SeCorr 08 by pressing the ON/OFF key for a couple of seconds.



3

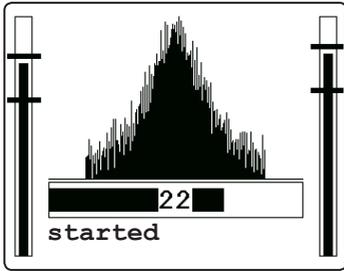
The initial screen is briefly displayed, containing information on the release number of the software and the battery capacity.

Then the central screen appears (see back of cover page). From this screen, you can access the individual menus (menu key) or start the desired functions.

- Keep the ON/OFF key pressed until the device switches off.

2.3 Channel assignment

	Channel 1	Channel 2
Is indicated together with message „battery empty“	RT 06-1	RT 06-2
Indication	Left	Right
Type with one signal channel	Director connection of microphone to SeCorr 08	Radio transmitter 2 (orange)
Type with two signal channels	Radio transmitter 1 (blue)	Radio transmitter 2 (orange)
Only one radio transmitter is used (e. g. in case of a defect):		
● Variant 1 (blue radio transmitter in use)	Radio transmitter 1 (blue)	Direct connection of microphone to SeCorr 08
● Variant 2 (orange radio transmitter in use)	Direct connection of microphone to SeCorr 08	Radio transmitter 2 (orange)



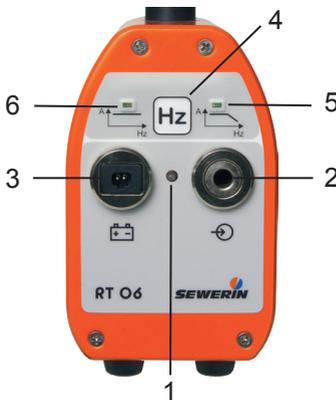
- During correlation measurements the noise intensity of both microphone channels is indicated to the left- and right-hand side of the correlation function.



Note:

The **SeCorr 08** version with two transmitters permits to connect a microphone directly two the **SeCorr 08**, e.g., if a radio transmitter is defective (see also section 7.8.3).

2.4 Radio transmitter RT 06



The radio transmitter **RT 06** can be operated with different sensors, EM30 microphones and the HA hydrophone.

It is recommended to use the active filter ZF01, if interfering noise is to be filtered out or if only a specific acoustic frequency range is to be transmitted to the correlator **SeCorr 08**.



CAUTION!

Connect always first the sensor to the measurement location (by coupling the microphone to the slide valve, hydrant, etc.). Then, switch on the **RT 06** by plugging the sensor into socket 2.

This sequence of steps ensures that the automatic amplification in the **RT 06** is quickly and properly set.

The **RT 06** is enabled when the sensor is plugged into socket 2.

Press the filter key 4 generally if plastic pipes are used. The right LED 5 is lit to indicate the changeover. If this setting is selected, only the low-pass frequencies are transmitted to the correlator. This may help to increase the quality of the correlation measurement. If the **RT 06** is switched on, all frequencies are always transmitted; the left LED 6 is lit.

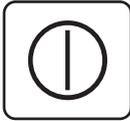
The transport handle on top of the antenna can be used for carrying the device.

LED 1 shows the state of the **RT 06**:

Operation:	green
Undervoltage:	flashed red
Charging:	1 x flashing green
Buffering:	2 x flashing green
No charging:	red (because temperature below 0 °C)

3 Operating elements

3.1 ON/OFF key

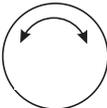


Press this key to switch the device on or off. Hold it pressed until the **SeCorr 08** is activated.

If the key is pressed only shortly, the currently running function is stopped (e.g., a correlation in progress). If you have opened the menu, you can use the ON/OFF key to return to the next higher menu level. Press the key only shortly.

If a correlation is stopped, the diagram (correlation function) can be zoomed in. If any key is pressed, the display returns to normal representation.

3.2 Rotary regulator



Turn the Rotary regulator to move the selection or the cursor to the left/right or up/down.

You can use the Rotary regulator to change values in numerical entry fields (e.g., pipe length).

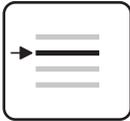
Press the Rotary regulator once to change the direction of movement from up/down to left/right or vice versa. Pressing the Rotary regulator has the same effect as pressing the Enter key.

3.3 Enter key



Press this key to enable the currently selected function. If you select „Cancel“ in the menu, the display returns to the central screen.

3.4 Menu key



Press this key to open the menu (see section 7).

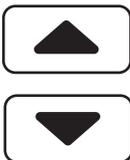
3.5 Left/right arrow keys



Press these keys to move to the left or right within the selected function. In some menus the arrow keys can also be used for selecting options.

You can access the next higher menu level by pressing the left arrow key. You can use this function only if the cursor is set to its left or right end position.

3.6 Up/down arrow keys



Press these keys to move the cursor up or down in a menu. In some menus the Arrow keys can also be used for selecting options.

3.7 Light key



Use this key to switch the illumination on or off. The illumination automatically switches off after a pre-set period (see section 7.8.4).

3.8 Adjusting the contrast



The contrast of the display is automatically controlled in relation to the temperature.

You can adjust the contrast manually by holding the Light key pressed while operating the Up or Down Arrow key at the same time.

4 Performing a correlation measurement

4.1 Entering pipe data

Before starting a measurement, it is required to enter the pipe data.



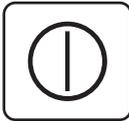
- Select option pipe data using the Arrow keys and confirm your selection with the Enter key. Then, enter the number of pipe sections.
- Depending on the type of application, select One, Two or Three pipe sections with the arrow keys. Confirm your selection with the Enter key.
- Enter the pipe length. Use the left or right arrow key to change between the displayed digits.
- You can use the Up/Down arrow keys to increase or reduce the displayed value in increments.
- Confirm the length with the Enter key.
- In the list, select the material of the pipe section using the Arrow keys. You can also use the direct option to enter the sound velocity manually.
- Pay attention to the following: The values in the list are approximate values and may be subject to inaccuracies (see section 5.)
- In the displayed list, select the pipe diameter using Arrow keys.

- Press Cancel to return to the main menu.

Depending on the selected settings (see section 7.6.2) either 16, 32, 64 or 128 averaging processes (i.e., measurements) are performed.

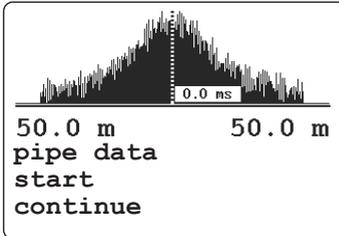
The display shows the currently performed measurement.

During the measurement, the correlation function is continuously updated.



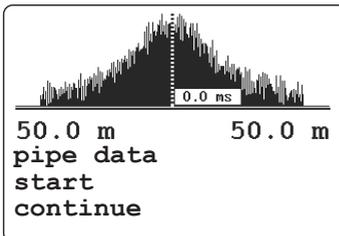
- The correlation measurement can be interrupted any time by pressing the ON/OFF key shortly.

An interrupted measurement can always be resumed.



- After the measurement the result is displayed. The adjacent illustration shows a correlation example. The method of display depends on the setting selected in the „Filter / Setup“ menu.

4.3 Evaluating the result



The correlation function uses peaks to indicate where a leak may be located. The time-delay difference is displayed on the x axis in ms (i.e., milliseconds). The highest peak is automatically highlighted.



CAUTION!

If a peak is displayed right in the centre of the screen, this may indicate that the RT 06 radio transmitter is placed too close to the **SeCorr 08** (receiver). In this case, increase the distance (5 – 10 m).

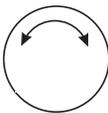
4.3.1 Filtering

Please read section 7.4 and 7.4.2 on the basic principles of filtering.

The filtering option here from the function in the main screen offers faster access to manual functioning than via Menu / Filter / Manual. The range of functions here is, however, limited.

- Select “Filter“ in the main screen.
- The left filter limit flashes and can be set.
- Enter key: calculates the result function; the other filter limit can be set (can be repeated as often as you wish).
- ON key: returns to the main screen, the result is displayed.

4.3.2 Cursor

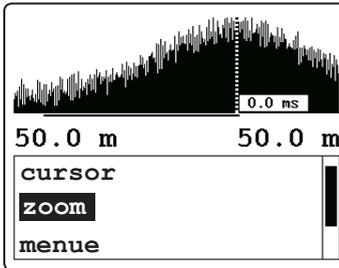


After selecting the Cursor function with the **Arrow keys**, you can move the cursor to any position using the **Arrow keys** or **Rotary regulator**.

Depending on the highlighted position, the measurement result is immediately recalculated. The time indicated next to the cursor represents the set time-delay difference.

Below the correlation function, the distance between the current cursor position and the two microphones is displayed.

4.3.3 Zoom



Use the Zoom function to zoom in any area of the correlation function.

- Select zoom with the Arrow keys.
- Zoom in the display by pressing the right Arrow key. The position bar 1 below the correlation function indicates which part of the total pipe length is zoomed in.
- Press the left Arrow key to return to the display of the complete correlation function.

**Note:**

If the correlation procedure is used, subjectively assessing the form of the correlation function may be significant. The experience required for this cannot be taken from books – only practice makes perfect.

The result of the measurement is based on the value marked in the CCF and on the entered pipe data. In simple terms, the correlation function represents – qualitatively and chronologically – the relation between the two noise signals that were recorded by both microphones.

It is generally not possible to distinguish between leakage noise (that is the noise that we are looking for) and other background noise. For this reason, the measurement result does not always represent a leakage point; background noise can also be the cause!

If no specific noise signal is present, the measurement result may be arbitrary. In this case, you should use positions with more distinct leakage noises for connecting the microphones.

4.4 Continuing a measurement

This function starts the correlation measurement using the available pipe data. The results obtained remain stored (e.g., from a previously performed correlation).

Pipe data changed after the last correlation is not used.

It is recommended to continue the measurement, if the result of the first measurement (e.g., number of averaging processes: 32) is not completely reliable.

```
50.0 m      50.0 m
pipe data
start
continue
```

- Select continue with the Arrow keys and confirm with the Enter key.
Perform the measurement as described in section „Starting a measurement“.

5 Measuring the sound velocity

5.1 General information

It is required to measure the sound velocity since only correctly entered sound velocity values ensure precise measurements. The sound velocity values are taken from an internal table, see section 7.6.7. However, the sound velocity values entered under Pipe data are only approximate values. Apart from that, it may also be possible that you do not know the pipe dimensions or material.

This function requires a noise source:

- You can use an opened hydrant, for example,
- which generates a clear display in the correlation-function field, thus being „correlatable“,
- whose location must be known,
- whose location should not lie in the central range of the measurement section, in order to increase the measuring precision.

If the measurement section consists of varying pipe sections (different materials or dimensions), the sound velocity measurement will lead to incorrect results.

5.2 Performing a measurement

The measurement procedure is very similar to that of correlation measurements.

- First, connect microphones and radio transmitter as described in section 2.2).
- Enable option Sound velocity in menu Measurement method (see section 7.5).
- Select Pipe data and enter the corresponding data.
- Under Artificial leak, enter the distance between the artificial leak and microphone 1: if it lies outside and beyond the measurement section
 - of microphone 1, enter 0 m as distance,
 - of microphone 2, enter the entire length of the measurement section under distance (i.e., the „pipe length“).

- Create an artificial leak to generate a noise source (e.g., opened hydrant) or take a hammer and beat rapidly on the fitting.
- Select Start with the Arrow keys.
The measurement procedure begins.
- After the measurement the correlation function is displayed on screen.
- The cursor is automatically set to the position with the largest value. Check whether this position corresponds to your artificial leak. If require, move the cursor with the arrow keys or Rotary regulator to the artificial leak.
- If you select Input in the menu:
 - The determined sound velocity is loaded into the internal memory.
 - The measurement method „Measure sound velocity“ is exited (reset to „standard“ method).
 - The central screen is called up.

You can now perform a correlation measurement for determining the real leak. When entering pipe data which may require modifying, it is recommended that you also enter the determined sound velocity. Select the item „Direct“ under ”Pipe material“ for this.

- If you select ”Cancel“ in the menu:
 - the determined sound velocity will not be accepted.
 - the measurement method “Measure sound velocity” is exited (reset to “Standard” method).
 - The central screen is called up.

6 Charging equipment



Built-in NiMH cells are used for supplying the **SeCorr 08** and **RT 06**.

The operation time of the **SeCorr 08** is approx. 8 hours. If the display illumination is used or if the outside temperature is low (so that the display heater is switched on), the operation time can be significantly shorter.

The operation time of the radio transmitter **RT 06** is min. 8 hours.

Optionally (if the battery is empty) the **SeCorr 08** and the radio transmitter **RT 06** can be operated with an external 12 V = power source (e.g. vehicle cable).

If the devices are to be charged or operated externally, either the **docking station HS 1,2 A** with the AC/DC adapter or the vehicle cable is required. Charging the **SeCorr 08** takes max. 4 hours. Charging the radio transmitter **RT 06** takes max. 5 hours.

Connect the vehicle cable to socket 1 on the docking station or to socket 3 on the transmitter **RT 06**.



The **SeCorr 08** and the **RT 06** transmitters can also be charged when put into transport case.

To do this, connect vehicle cable or AC/DC adapter to socket 1 in the case.



Inside the transport case, connect cables 2 and 4 to the two **RT 06** transmitters and cable 3 to the docking station HS 1,2 A.

6.1 Battery state

The battery state is indicated on the **SeCorr 08** display by a battery icon together with the following messages:

- **RT 06-1** or **RT 06-2** or **SeCorr 08**

Battery icon and message appear when the operation time of the corresponding component is less than 15 minutes.

More details are indicated by the status LED on the **RT 06**, see also section 2.4.

6.2 Charging process/battery maintenance

During charging, the **SeCorr 08** displays a number indicating the remaining charging time in hours. In this mode, you can select the function Battery maintenance using the menu key. With this function, the battery is first discharged and then recharged. This ensures that chemical deposits inside the battery are removed and that the memory capacity of the battery is improved. The process takes approx. 10 hours. It is recommended to use this function regularly (in cycles of 60 days) for devices which are only rarely used.

Symbols and their meaning during the charging process:



Battery maintenance is enabled.



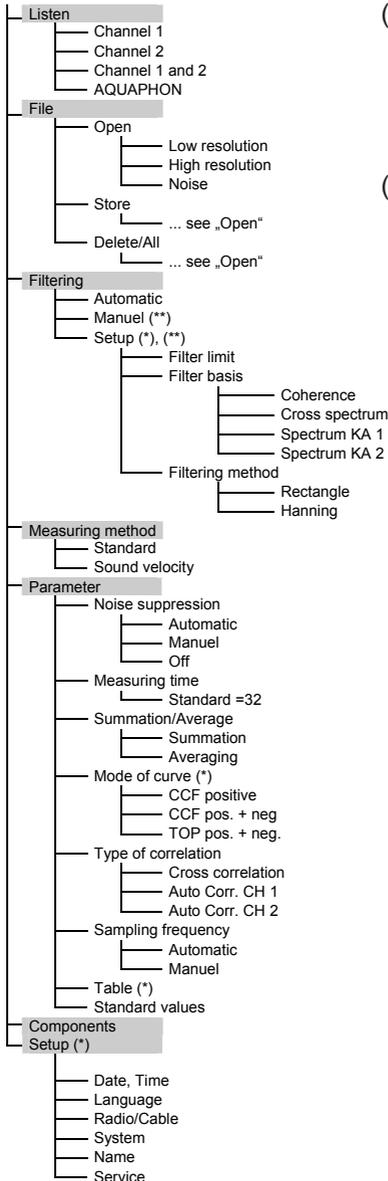
The temperature has dropped below 0 °C, the battery cannot be charged.



The temperature has exceeded 45 °C, the battery cannot be charged.

7 Menu

7.1 Menu structure



(*) Settings which remain stored after switching off the device. All other settings are reset to the respective standard values (see section 7.6.8).

(**) This menu and the corresponding functionality is only available in the professional version.

**Note:**

Certain menu items are not available in the standard version. If you select an item which is not available, an appropriate message is indicated. If you want to upgrade from the standard version to the professional version, a registration code is needed.

7.2 Listen

Use the Listen function to set the sound level of both channels.

- Select the channel which you want to change with the arrow keys.
- You can then change the sound level of the selected channel using the arrow keys or Rotary regulator.
- If you select „Channel 1“, you will hear channel 1 on both ears (mono mode). The same applies to „Channel 2“. If you select „Channel 1 and 2“, you will hear both channels at the same time (stereo mode).

7.2.1 AQUAPHON

Use the “Aquaphon” function to enable the integrated feature for searching leaks. This feature can be compared to that of the Sewerin AQUAPHONA 100/AF 100 device. These devices, however, are provided with a considerably wider range of functions. You can use the microphones of this system.

The maximum measured value can be measured in the vicinity of the leak.

Select the menu option Correlator to return to the correlator mode.

To switch off the device:

- pull the microphone connector from the socket (otherwise the device is switched on again and again)
- enable the Correlator menu item (this permits to save the modified settings for sensitivity and sound volume)
- press the ON/OFF button.



Note:

You can access the Aquaphon mode directly by connecting a suitable microphone to the disabled device (power OFF).



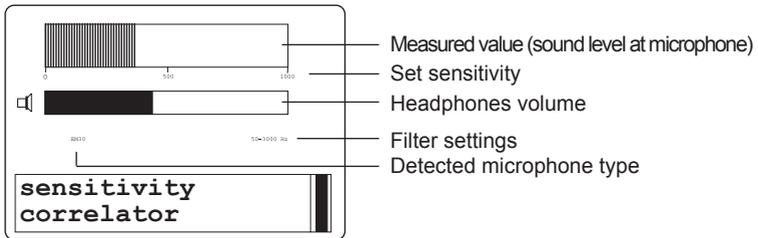
CAUTION!

Do not use the headphones with high volume. Audiologists warn that the exposure to persistent or sustained noise may result in hearing defects.

- Set the volume to an appropriate level.
- Switch off the headphones when you suspect that interfering noise may occur (pedestrians, cars, etc.).
- Switch off the headphones before moving the microphone.
- Bear in mind that your perception capability is reduced.

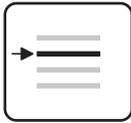
7.2.1.1 Display

The display contains the following components:

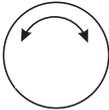


7.2.1.2 Assignment of keys

In the Aquaphon mode, the key assignment of the **SeCorr 08** differs from the standard mode.

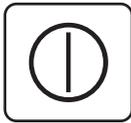


Switch ON/OFF the headphones.



Turn the Rotary regulator to set the volume of the headphones.

The headphones are switched on as long as you press on the Rotary regulator.



Use the ON/OFF key to change the sensitivity level (see section below).

7.2.1.3 Sensitivity

Use the Sensitivity option to set the basic amplification of the leakage noise.

You can select the following levels

- sensitive (display range 10)
- medium (display range 100)
- insensitive (display range 1000)

7.3 File

In this menu, you can open, save and delete individual measurements. The professional version also permits to open, save and delete sound samples. The data is filed in the internal storage of the **SeCorr 08** and can be called up even after switching off the device.

7.3.1 Store

The following number of storage locations is available:

- a) 50 storage locations (low resolution)
- b) 25 (1 – 25) storage locations (high resolution)
- c) 5 (1 – 5) storage locations (sound)

Note:

b) and c) share a common storage area.

Measurements which were stored with a low resolution cannot be post-processed (e.g., filtered) at a later date. Only the central screen can be called up for viewing.

Functions: View of the central screen,
cursor navigation,
starting, continuing.

50 storage locations with low resolution are available.

Measurements which were stored with a high resolution can be post-processed at a later date. This means that all functions which are usually possible after closing (i.e., stopping) a measurement, are also possible in this situation. Exception: It is not possible to „continue“ the measurement.

Up to 25 storage locations are available. These locations are shared with the „sound“ storage.

If you select Noise, the currently measured noise is stored for approx. 7 seconds.

Pay attention to the following: Saving takes approx. 35 seconds due to the high memory capacity. The process cannot be interrupted.

- Use the arrow keys to select the item which you want to save:
Low resolution, High resolution or Noise.
- After confirming with Enter, the measurement or noise signal is saved.

7.3.2 Open

Use the arrow keys to select the item which you want to open:

- Low resolution, High resolution or Noise. Please note that it takes approx. 25 seconds to load a sound.
Confirm your selection with the Enter key.
A list is displayed including all files of the **SeCorr 08** memory.

- Select a file with the Arrow keys and confirm your selection with the Enter key.
- If you have opened a measurement, it will then be displayed. If you have opened a noise signal, the noise will be played back with a phasic duration of 7 seconds. You can cancel the playback by shortly pressing on the ON/OFF key.

7.3.3 Delete

- Use the Arrow keys to select the item which you want to delete: low resolution, high resolution or noise. Confirm your selection with the Enter key. A list is displayed including all files of the **SeCorr 08** memory.
- Select the file which you want to delete with the Arrow keys and confirm your selection with the Enter key. The file is then deleted.

7.4 Filtering

You can use the filtering function to cut off certain frequencies from the correlation function, thus leading to improved results.

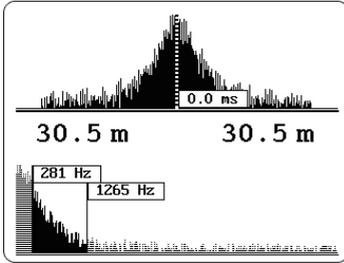
You can select between manual or automatic filtering.

7.4.1 Automatic filtering

After a measurement, **SeCorr 08** performs an automatic filter run (post-processing). During this procedure the filters are automatically optimised.

7.4.2 Manual filtering

An image is generated in which you can see a frequency trend (filter base at the bottom of the image, see chapter 7.4.3.3), as well as the result based on the set filters (representation, see chapter 7.6.4).



Press the Enter key to change to the editing mode.



- Use the Arrow keys to select the filtering limit which you want to change:
 - Filter left
 - Filter right
 - Cut off left
 - Cut off right



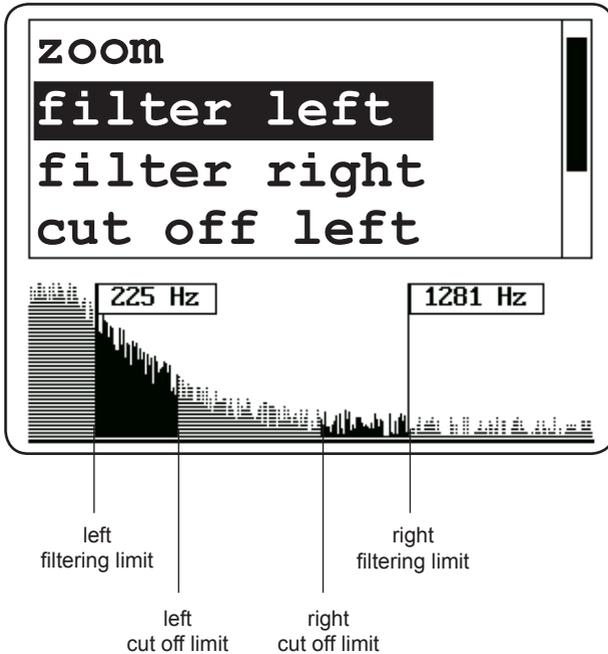
- Use the arrow keys to shift the corresponding limit.

The appropriate frequency is displayed on screen.

Light grey frequency ranges are cut off.

Ranges which are indicated in black are used for correlation.

If you want to **zoom in** the frequency range, you need to change the set filter limits beforehand (see chapter 7.4.3.1).



- Select "OK" with the Arrow keys.

The set filters are applied and the indicated frequency trend is updated together with the result.

- Press the Enter key to return to the direct filtering screen to redefine other filter limits, if necessary.
- Select "Return" to return to the central screen and to store the changed settings.

7.4.3 Setup

Customized settings are saved in the setup, sparing users the task of calling up the desired functions every time they are required. Place the cursor on the desired item and press the Enter key.

7.4.3.1 Filter limits

Use this setting to define the filter settings to be used for manual filtering (see chapter 7.4.3.1).

Default setting: If you enter a sound velocity for a measurement which is lower or higher than 700 m/s, the correlator uses the following values:

Lower limit / Hz		Upper limit / Hz	
< 700 m/s	5	500	Synthetic material / plastic
> 700 m/s	0	3000	Metal

It plays no role whether the sound velocity is manually entered or whether appropriate pipe parameters are selected.

7.4.3.2 Filter basis

You can use this menu option to change how the frequency curve of the filter setting is represented.

- Coherence
This function is used to indicate similar frequencies.
- Cross spectrum
This function is used to indicate the cross spectrum of both channels.
- Spectrum, CH 1
Used to indicate the frequency spectrum of channel 1.
- Spectrum, CH 2
Used to indicate the frequency spectrum of channel 2.

7.4.3.3 Filtering method

If rectangle is selected, signal filtering is performed precisely at the marked point.

With Hanning, the range of the marked point is faded in with soft transitions.

7.5 Measurement method

You can use the measurement method function to change between standard measurement (= correlation measurement) and sound velocity measurement (see section 5).

7.6 Parameter

Use the parameter sub-menus to set parameters which are having effect on the measurement.

7.6.1 Noise suppression

The noise suppression function can be used for reducing the negative effect of temporary interferences (vehicles, pedestrians).

If the noise suppression function is enabled, it is assumed that optimum results can be achieved in those moments in which the measured noise (signal) is relatively low. This means that the permanently present leakage noise is preponderantly undisturbed.

In moments in which the signal is relatively loud, the additional noise must come from a interference source in all probability, leading to much less reliable measurement results.

The level range is limited by the upper threshold and the lower threshold. During a running measurement, these thresholds for signal 1 and 2 are indicated as horizontal lines on the left or right edge of the display.

After a defined interval, the level range is automatically and slowly increased, if the current level values lie permanently above the level range. In the same way the level range is reduced, if the current level values lie permanently below the level range.

a) Automatic mode (Default setting)

This setting is recommended for standard situations and ensures reliable results.

After a defined interval, the level range is automatically and slowly increased, if the current level values lie permanently above the level range. In the same way the level range is reduced, if the current level values lie permanently below the level range.

b) Manual mode

This setting is recommended, if you want to work with maximum interference suppression and if you desire greatest possible influencing control for measurements.

If the interruption is too long due to excess noise, it is possible to manually increase the level range with Continue, so that the sensitivity level is reduced. The measurement is continued with the operator ignoring a certain level of interfering noise.

If the current level values fall below the level range, an adjustment is automatically performed, i.e., the correlator is set to a more sensitive level.

c) Off

It is recommended to select this setting only in situations which are marked by frequently returning, strongly varying signals resulting in the measurement being frequently interrupted, thus preventing a correlation completely.

Noise suppression is disabled. With this setting, it is accepted that interfering noise is jamming the leakage noise from time to time.

7.6.2 Measuring time

You can use the Measuring time function to define how many individual measurements are to be performed until the measurement sequence is stopped.

7.6.3 Summation/average

With the „Summation“ function all individual results are used for representing the CCF. This representation is immediately used.

If you select „Average“, the individual results are evaluated using a different procedure: The last performed measurement has the largest influence on the CCF. The preceding measurement has less influence, etc.

This procedure ensures that the CCF, with selected Average, represents the current noise situation.

7.6.4 Mode of curve

You can change the mode how the correlation function is represented as follows:

- CCF positive
The CCF has only positive values.
- CCF pos. + neg.
The CCF contains positive and negative values.
- TOP positive
The representation is similar to that of CCF positive. Peaks, however, are represented more significantly in most cases.
- TOP pos. + neg.
The representation is similar to that of CCF pos. + neg. Peaks, however, are represented more significantly in most cases.

7.6.5 Correlation

If **Cross correlation** is selected, the noise source to be located must lie within the measurement section. The measurement is carried out with both channels (1 and 2).

With **Auto correlation**, either channel 1 or channel 2 is used. The second signal required for the correlation is created by the noise reflection which is detected at the reflection point. It is required that the signal is received by the channel which is to be used.

Since the energy of the reflected noise signals is generally extremely low, it is recommended to use this procedure only in special cases. If the pipe contains gases, the chances may be better.

If Auto correlation is used, the location of the reflection point must be known.

The auto correlation function (ACF) always runs symmetrically. Only the negative range of the auto correlation ($\Delta t < 0$) is significant.

7.6.6 Sampling frequency

The continuous time signal of the used channels is sampled and digitised with a particular frequency, the sampling frequency.

The lower the sampling frequency, the less time is required for calculating the averaging processes. However, the used sampling theorem demands a sampling frequency which is at least twice as high as the highest frequency contained in the signal! Setting the sampling frequency too low may lead to faulty measurements. For this reason, it is recommended to decrease the sampling frequency only in special cases, e.g., if extreme low-frequency noise is to be measured.

If Automatic is selected, the sampling frequency is set to its maximum height.

If you want to define the setting manually, select Direct. You can then change the sampling frequency with the arrow keys.

All following measurements are performed with this sampling frequency.

7.6.7 Table

In this menu, you can select two different sound velocity tables. They differ in subranges.

Sound velocity 1: Particularly good experiences in France

Sound velocity 2: International validity

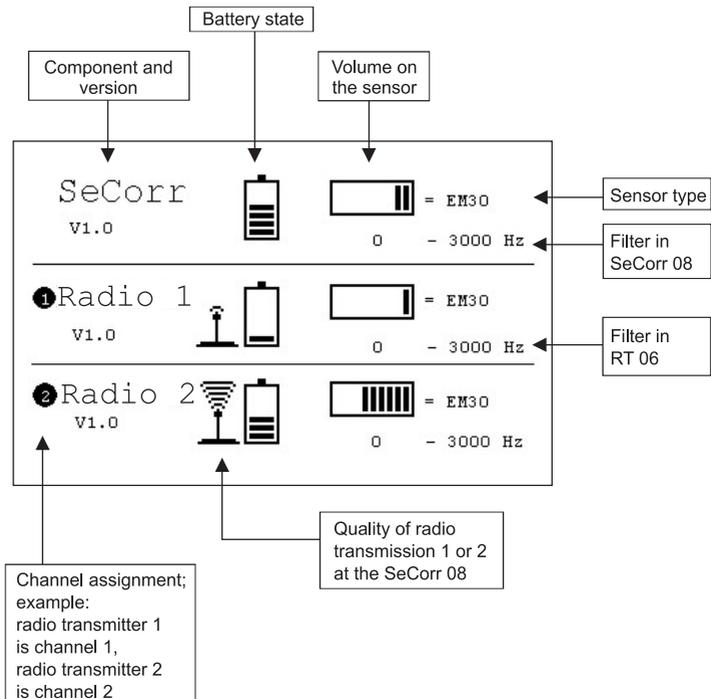
Sound velocity 3: This function is not available

7.6.8 Standard values

All parameters in the Parameter menu of the **SeCorr 08** are reset to the respective standard values. This also includes those parameters which remain stored after switching off the device. The set language is not changed.

7.7 Components

The screen shows an overview of the most important information on the max. 3 main components of the system (2 **RT 06** devices, 1 **SeCorr 08** correlator).



Symbol explanation

	Battery empty		Battery fully charged
	Low volume		High volume
	Bad signal reception		Good signal reception

7.8 Setup

7.8.1 Date, time

Use this option to set the current date and time. You can also select the date format.

7.8.2 Language

Use this option to select the desired language.



Note:

If „American English“ is selected, several product-specific units of measurement will change.

For example:

- Distance feet (ft),
- Diameter inch (in)
- Velocity feet per second (ft/s)

7.8.3 Radio/cable

Use this option to define which channel is to be operated with radio transmission and which channel is to be directly connected to the **SeCorr 08**.

- Use the Arrow keys to select the channel which you want to change. Confirm your selection with the Enter key.
- Use the Arrow keys to toggle between RT 06-X and SeCorr 08, with RT 06 standing for radio transmission and SeCorr 08 for cable operation. Confirm your selection with the Enter key.

7.8.4 System

You can use this option for:

- Setting the time at which the light is to be switched off automatically.
- Setting the time at which the device is to be switched off automatically.

7.8.5 Name

This option is used for entering name, company and address.

7.8.6 Service

This menu option is reserved for the Sewerin service.

8 Methods of optimising measuring results

The location is based on the correct determination of the time-delay difference. If the leakage noise is sufficiently loud and if there are no background noise sources, the time-delay difference is adequately well-displayed after only a few averaging processes (4 to 16).

But what can be done if no sufficiently clear peak can be generated? The following instructions cannot substitute practice and experience still required in difficult situations. However, they will help you to learn the basic operations.

Be that as it may, you must always remember one thing: If the leakage noise does not reach the microphones with sufficient intensity, no correlation is possible!

8.1 Changing the number of averaging processes

If a result is unsatisfactory after the initial series of averaging processes, you can improve it by increasing the number of cycles. The result is improved because the calculation is based on a greater body of information on the chronological behaviour of the leakage noise. However, experience has shown that the result can only rarely be additionally improved if more than 64 to 128 averaging processes are selected.

8.2 Using filters

Use the features made available by the mathematical filters. Unfortunately it is hardly possible to give any generally valid „formula“. Only your own experience, i.e., learning by doing, will lead to success.

In most cases, it is only practical to select frequency ranges for the correlation function in which the coherence function does clearly stand out from its environment, i.e., where there is peak.

Individual frequencies from various interference sources generate a uniformly sinusoidal correlation function. They can be recognised in the spectra as sharp lines.

8.3 Automatic filtering

The **SeCorr 08** can perform an automatic filter run (post-processing) after a measurement (see chapter 7.4.1). This procedure is used to optimise the filters of the coherence function with the help of statistical methods. This permits to obtain optimum correlation results.

You may perform an automatic frequency analysis for both, running measurements or already stored measurements.

8.4 Checking the microphone connections

Make sure that the microphones are firmly and securely plugged into their sockets. Remove any dirt or rust.

8.5 Using accessories

Use Sewerin accessories and auxiliary equipment. Use a hydrophone for plastic pipes. The active filter makes additional features available. You can use the „teach yourself“ tape to check the system and to keep your level of knowledge up-to-date with a minimum of effort.

8.6 Changing the location

Use a different location for positioning the microphones. Even remote locations can generate better results if the sound transmission is improved.

8.7 Saving time

If it turns out during a measurement that it is not possible to record a peak, all run-up efforts to collect precise data on the pipe were in vain. Practice has shown that it might be better to start the measurement with estimated pipe data. If it turns out that the assumed pipe length is greater and/or the sound velocity lower than expected, a possible peak will appear in any case within the correlation function – which simply cannot be „overlooked“.

Also with this more practice-oriented approach, it is still required to determine the pipe data precisely.

9 Communication with PC

It is possible to transmit measurements to a PC which are stored with high resolution in **SeCorr 08**. These files can be archived and post-processed on computer (e.g., to set up a protocol). In addition, it is possible to print out data and graphics, provided that a printer is available. The stored „sound“ as well as measurements with low resolution cannot be transmitted.

9.1 Requirements

PC (operating system: Windows 95 / 98 / 2000 or XP)

Program “SeCorr 05” (PC correlator software), from version 10.16 onwards (15.1.2003)

SeCorr 08 Professional version

9.2 Software installation

Install the SeCorr 05 software (demo version on CD) on the PC.

- Connection of all cables and connectors:
Connect any serial interface of the PC to the **SeCorr 08** (socket with cap at the left-hand side of the device). Use the communication cable (accessory) for this. The PC must not be configured to an interface higher than COM 4.
- Put the **SeCorr 08** into the HSM docking station which is supplied with 12 V=. It plays no role whether the SeCorr 08 is switched on or off.
- Transmitting data from **SeCorr 08**:

Start the SeCorr 05 program and select function SeCorr 08 in the File menu.

The data is transmitted, converted and stored in the „SeCorr 08“ target directory. Depending on the extent and number of measurements this process may take some time. The progress of transmission is indicated on the computer. The SeCorr 08 target directory is generated in the working directory from which the SeCorr 05 program was started, e.g., C:\CORWI.

The file names are automatically generated using the measuring date and the measurement time in **SeCorr 08** (which is precise to the minute). They have the following format:

HA_DD-MM-YYYY_HH-MM.COR

with:

DD-MM-YYYY = Date (day, month, year)

HH-MM = Time (hour, minute)

The files can be managed (e.g., renamed, moved) just as any other file.

– Opening measurements

In the SeCorr 05 program, you can open measurements with File Open file. You can find more detailed information on how to use SeCorr 05 in the program's help menu.

10 Technical data

Correlator SeCorr 08

Operation time:	approx. 8 hours
Operating temperature:	-10 °C – +40 °C
Storage temperature:	-20 °C – +60 °C
Charging time:	4 hours
Weight:	1.3 kg
Protection class:	IP65
Dimensions (W × H × D):	125 × 180 × 65 mm

Radio transmitter RT 06

Signal transmission:	500 mW
Charging time:	5 hours
Operating time:	10 hours
Filter setting – wideband:	0 – 3000 Hz
Filter setting – low-pass:	0 – 300 Hz
Weight:	1.3 kg
Dimensions (W × H × D):	73 × 190 × 125 mm (with antenna = 510 mm)
Protection class:	IP67

11 Accessories

Communication cable	between PC (COM interface) and SeCorr 08 correlator.
Carrying case	with foam inset for the correct arrangement of correlator, radio transmitter, microphones and head phones.
Hydrophone type HA	e.g., for connection to inhouse PE pipes after dismantling the water meter.
Hydrophone adapter UFH DN 80 for 1" female threads	between ground hydrant and hydrophone type HA.
Adapter for main pipes M10	for the permanent coupling of a microphone to a slide valve or hydrant.
Adapter for in-house connection M10	for the permanent coupling of a microphone to an in-house cut-off valve.
Piezo microphone EM30	non-corrosive version
Active filter	for suppressing interferences
Test-and-teach-yourself tape	cables incl.
Test-and-teach-yourself CD	cables incl.

12 Error messages

Error code	Cause
Radio! RT 06-1	<p>This message may appear if a correlation measurement is to be started. It is used to warn the operator. It is nevertheless possible to perform a correlation measurement. However, the quality of the radio transmission may be worse.</p> <p>This error message appears when:</p> <ul style="list-style-type: none">● the radio transmitter is not operated,● the transmission is impaired by buildings, etc. between SeCorr 08 and RT 06,● the distance between SeCorr 08 and RT 06 is too large. <p>Remedy:</p> <ul style="list-style-type: none">● Check the corresponding radio transmitters. Are they really switched on?● Position the radio transmitter in such a way that the signal route between transmitter and correlator is as good as possible (line-of-sight between transmitter and receiver).● Check the radio transmission with the headphones. Can you hear any distinct (leakage) signals or only noise?
Radio! RT 06-2	see „Radio! RT 06-1“
Microphone! Channel 1	<ul style="list-style-type: none">● no microphone connected
Channel 1 (resp. 2)	<ul style="list-style-type: none">● automatic amplifier is being readjusted (simultaneous display of a bar graph showing the progress)

Error code	Cause
F200	Communication error Error F200 can be ignored if they appear only occasionally. If they appear frequently, contact the SEWERIN service..
F201	Communication error Error F201 can be ignored if they appear only occasionally. If they appear frequently, contact the SEWERIN service..



Note:

If further error codes are indicated, please contact the SEWERIN service!

13 Annexe

13.1 EC Declarations of Conformity

Hermann Sewerin GmbH hereby declares that the **SeCorr 08** fulfils the requirements of the following guidelines:

- 2004/108/EC

The transmitter **RT 06** fulfils the requirements of the following guidelines:

- 1999/5/EC

The complete declarations of conformity can be found online (www.sewerin.com > Downloads).

13.2 Advice on disposal

The European Waste Catalogue (EWC) governs the disposal of appliances and accessories.

Description of waste	Allocated EWC waste code
Device	16 02 13
Disposable battery, rechargeable battery	16 06 05

End-of-life equipment

Used equipment can be returned to Hermann Sewerin GmbH. We will arrange for the equipment to be disposed of appropriately by certified specialist contractors free of charge.

13.3 History of changes

Version	Description	Date
4.0	<ul style="list-style-type: none"> ● Additional function available in central screen: filtering. It performs a faster and simplified access to manual filtering 	March 2006
3.0	<ul style="list-style-type: none"> ● Extended functionality of RT 06 (additional filters). Improvement of radio transmission characteristics. Not (!) compatible with RT 06 without filter. ● Additional listening feature (mono) in the correlator mode ● Structural modification of the "Filter" menu 	December 2004
2.1	<ul style="list-style-type: none"> ● Upgrade of PC correlator program SeCorr 05, version 11.xx. By that means data read-out to PC has been improved, the same sound velocity tables are used. ● new error codes, which refer to microphones not attached. 	January 2004
2.0	<ul style="list-style-type: none"> ● Modifications in the Aquaphon Mode ● Storage of sounds ● Storage of measurements with high resolution ● Transmission of measurements to PC ● Post-processing of measurements on the PC ● 2 different sound-velocity tables ● Modifications in the operating sequence of sound-velocity measurements 	January 2003

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Hermann Sewerin GmbH
Robert-Bosch-Straße 3 · 33334 Gütersloh · Germany
Telefon +49 5241 934-0 · Telefax +49 5241 934-444
www.sewerin.com · info@sewerin.com